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**Qualities of life, educational level, and human development:
an international investigation of health.**

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The WHOQOL Group comprises a co-ordinating group of collaborating investigators in each of the field sites and a panel of consultants. Dr Rex Billington directed this project that was initiated by Dr John Orley and Dr Norman Sartorius. The work reported here was carried out in 24 of the field sites: Prof. H. Herrman, St. Vincent's Hospital, Australia; Dr S. Bonicatto, FUNDONAR, Argentina; Dr M. Fleck, University of the State of Rio Grande do Sul, Brazil; Dr V. Petkov, National Centre for Interdisciplinary Human Studies, Bulgaria; Prof. S. Szabo, Prof Z. Metelko and Mrs M Pibernik-Okanovic, University of Zagreb, Croatia; Professor M.C. Angermeyer and Dr R Kilian, Department of Psychiatry, University of Leipzig, Leipzig, Germany; Dr L. Kullmann, National Institute for Medical Rehabilitation, Hungary; Dr S. Kumar, Chennai Medical College, Madras, India; Dr S. Saxena and Dr Rachna Bhargava, All India Institute of Medical Sciences, New Delhi, India; Dr M. Amir, Ben-Gurion University of the Negev, Beer-Sheva, Israel; Dr G. de Girolamo, Instituto Superiore di Sanità, Rome, Italy; Dr M.Tazaki, Science University of Tokyo, Japan; Dr H. Che Ismail, University of Sains Malaysia, Kelantan, Malaysia; Dr M. Kalfoss, Oslo College, Norway; Dr A. Lomachenkov, V.M. Bekhterev Psychoneurological Research Institute, St Petersburg, Russian Federation; Dr R. Lucas Carrasco, Barcelona, Spain; Dr C. Fidaner, Izmir Cancer Registry Center, Turkey; Prof. S. Skevington and Dr K. O'Connell, University of Bath, Bath, United Kingdom; Prof. D. Patrick, Ms M. Martin and Dr D. Buesching, University of Washington, Seattle, United States. Some data was collected as part of the Longitudinal Investigation of Depression Outcomes (LIDO) study directed by Health Research Associates Inc., and in several field centres of the WHO Disability Assessment Schedule (WHODAS) validation study (ACE Group, WHO, Geneva). Further information on the WHOQOL can be obtained at <http://www.who.ch/msa/mnh/mhp/ql.htm>

Keywords: quality of life, mental health, education, WHOQOL-Bref, culture

Running head: International quality of life, education, and mental health

Abstract

This study investigated the relationship between health-related quality of life (QoL), educational level and culture, using a high quality cross-cultural generic measure (WHOQOL-BREF) containing 25 international dimensions organised in physical, psychological, social and environmental domains. Cross-cultural data from 9,404 sick and well adults in 13 countries showed that environmental QoL increased positively and sequentially from no education to tertiary education. The other three domains increased only up to secondary school level. These MANCOVA results were significantly influenced by **gender** cultural group, health status and economic development. More positive feelings, lower dependence on medication and treatment, better perceptions of financial resources, physical environment, and opportunities for information and skills represent adult QoL advantages to those who received tertiary education, compared with secondary schooling. Developing countries reported poorer environmental, psychological and physical QoL than developed countries, although social QoL was good and the best, and no different for the two development bands. In developing countries, only psychological QoL distinguished between every educational level. Detailed increased positive feelings and diminishing negative feelings serve to link better mental health with more education. Across each domain, secondary and tertiary education was associated with better QoL in developing countries. The results support a QoL case for universal secondary education on which better health and health care may be built.

Promoting good quality of life (QoL) is central to the mission of many international agencies:

“Especially in the world’s poor countries, a better quality of life generally calls for higher incomes, but it involves much more. It encompasses as ends in themselves, better education, higher standards of health and nutrition, less poverty... and a richer cultural life” (World Bank, 1991).

Despite international consensus that improving QoL is vital, often these concepts are only indirectly assessed through objective indicators, like standard of living. However a growing number of cross-national studies show how material resources only partially predict happiness and life satisfaction (LS); both of which are components of subjective well-being (SWB)(Myers, 2000). Poverty is linked with poor SWB, but once wealth and resources rise beyond a certain level, this association is largely dissipated (Inglehart & Klingemann, 2000; Inglehart et al, 2008; Diener & Oishi, 2000). This pattern persists irrespective of whether happiness, LS or objective well-being are substituted, and despite continuing refinements to methodology and outcome measure sensitivity (Kahneman, 1999). Furthermore, loose consensus about concept definitions and their relationships provides opaqueness that serves to impede progress. However, it is not yet known how far QoL assessment could provide international comparisons that are comparable with other standard measures, e.g. GNP per capita and utility (Nussbaum, 2000; p6).

One reason why subjective QoL was not measured, was due to a paucity of quality multilingual instruments. In the last decade, a new generation of generic profiles have been standardised e.g. SF-36 (Ware et al, 1992) and WHOQOL (1995). Although the SF-36 displays good psychometric properties in US populations, its translations typically perform more poorly (e.g. Alonso et al, 1998). This is because US concepts and language have limited meaning in other cultures. This loss of semantic, conceptual and hence metric equivalence between language versions, is due to the use of outdated serial translation methods (Berry, Poortinger et al, 1998). However a novel simultaneous ‘spoke-wheel’ methodology designed by the WHOQOL Group (1994) used international collaboration to improve equivalence, and this procedure also accelerated instrument development (Skevington, Sartorius & Amir, 2004). A landmark review by Bowden & Fox-Rushby (2003) concluded that the WHOQOL is now the best available instrument for cross-cultural use. Here QoL is defined as *‘An individual’s perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns’* (WHOQOL Group, 1994).

Subjective well-being (SWB) is a measurement comprising positive and negative emotions with LS (Diener, Oishi & Lucas, 2003) and 90's research on social indicators showed that educational level and health affected SWB (e.g. Triandis, 2000). However SWB represents only part of the broader QoL concept (Camfield & Skevington, 2008). Although LS is also related to educational level (e.g. Fernandez Ballesteros et al; 2001), and is a part of QoL, it is not its whole (Sirgy, 2001). Furthermore any such investigations are rarely cross-cultural, unlike an Asian study by Thumboo, Fong, et al (2003), or conducted in developing countries like Nigeria (Olusina & Ohaeri, 2003). Where cross-cultural studies exist they typically focus on specific disease groups or situations, rather than heterogeneous populations in diverse conditions. Global models of subjective QoL, educational level and health therefore remain to be adequately explored using generic instruments. Lastly, without the perspective obtained from applying a single multilingual, multidimensional measure to collect genuinely cross-cultural data, firm conclusions about the universality of this case are problematic. For reasons outlined below the WHOQOL instrument is highly suited to this purpose.

The following research questions were posed:

1. Do those receiving less education have poorer subjective QoL than those with more education? It was expected that QoL would increase significantly and positively between successive educational levels (no education to tertiary education) on the four domains assessed by the WHOQOL - psychological, physical, social and environmental (The WHOQOL Group, 1998).
 2. Is the relationship between educational level and QoL influenced by a country's level of human development? It was expected that QoL would be higher in highly developed countries compared with developing countries, as identified by the Human Development Index.
 3. Do characteristics like gender, age, the presence or absence of illness, and culture affect the relationship between QoL, education and development? It was expected that each of these important factors could have a significant impact on this association in view of simple differences found in previous international WHOQOL studies (Skevington, Lotfy and O'Connell, 2004).
- In this study, individual QoL data were aggregated to provide a systems-level of analysis.

Method

The WHOQOL-BREF was administered in 24 centres located in 23 countries: Argentina, Australia, Brazil, Bulgaria, China, Croatia, Germany, Greece, Hungary, Israel, Italy, India (Madras & New Delhi), Japan, Malaysia, Netherlands, Nigeria, Norway, Romania, Russia, Spain, Turkey, UK and USA. They were selected with reference to WHO Region, diversity of culture,

and socio-economic development level. World Health Organisation ethical approval was obtained for the international field trial of the WHOQOL-BREF. Secondary data was analysed in the present study; it had been previously used to test the main psychometric properties of the WHOQOL-BREF (Skevington, Lotfy & O'Connell, 2004)).

Adults were recruited from primary, secondary, tertiary and rehabilitation settings, and well communities. Quotas structured the sample providing targets for equal gender and age groups (<45 & >45 years). Well and sick respondents ranged across virtually all ICD categories, to maximise heterogeneity. A representative design was not feasible due to inaccessible health statistics in some countries.

Measures: The WHOQOL-BREF is a multi-dimensional, multi-lingual, generic profile, standardised for sick and well populations in diverse cultures. It assesses 25 important aspects or facets of QoL, organised and scored in four domains: physical health, psychological state, social relationships and environmental QoL. The WHOQOL-BREF shows good psychometric properties of internal consistency reliability, content validity, and discriminant validity (WHOQOL Group, 1998; Skevington, et al, 2004). Studies containing over 16,000 people in 40+ countries confirm construct validity (WHOQOL Group, 1998). Data is collected about gender, age, marital status, health status and highest educational level i.e. none (0), primary (1), secondary (2), or tertiary (3). Educational level is a proxy for income, wealth, and social status (e.g. Manly, 2006). It is easier to interpret than income in international comparisons of disparate economies. In some cultures e.g. England, questions about educational level are more acceptable than financial status (Skevington, Mac Arthur & Somerset, 1997).

The Human Development Index (HDI) internationally monitors country development levels. Information on mortality (life expectancy: birth), knowledge (adult literacy rates; students in education), and income (standard of living; GDP per capita) is integrated (United Nations Development Programme, 1990). In 1999, the HDI of 162 countries was assessed. Data from this year was selected to match the median WHOQOL-BREF data collection period.

Analysis: Centre data was cleaned and merged. From a total of 11,801 participants, 9,404 were retained because some centres did not record educational level. Centre frequency distribution across educational level was inspected to ascertain whether there was sufficient data for reliable analysis. As education contributes to the HDI, it was expected and confirmed that uneducated participants would be infrequently recruited in high HDI centres.

Some countries e.g. Brazil, had difficulties with non-literate populations. To avoid bias, they interviewed the whole sample.

Centre samples ranged from 27 to 2,388 (Table 1). To be included, centres had to recruit >20 to each of the two lowest educational categories; excluded centres commonly contributed <100 to the total. Consequently 13 centres (n=8,625) were analysed: 4 medium HDI countries (two centres in India: north and south), and 8 high HDI countries. About half the sample was collected in India, Norway and Germany. As the only Nigeria (n=50) was a low HDI country, it was included in some centre analyses for benchmarking purposes. Age was recoded into 10 year age bands. Health status at the time of assessment was recorded as ill or not ill; incomplete data featured in some centres.

INSERT TABLE 1 HERE

Results

Table 1 shows the breakdown of 9,404 participants from 24 centres (cultures). Gender groups were almost equal (4,495 men; 4,858 women), and mean ages very similar (women 45.32; men 45.35; range 12-97). Forty-five % were ill; centres differed in the proportion of sick and well recruited ($p<.01$). Major illness groups were cancer (17%), depression (11%), diabetes (11%), cardiovascular (11%), and musculoskeletal (4%) diseases. Few (731) did not finish primary school (women 439); 2,666 completed primary school (women 1,423), the majority (3,743) completed secondary school (women 1,849), and 2,264 received tertiary education (women 1,147). Sixty-six % resided in high band countries, 33.5% medium, and 0.5% low.

INSERT TABLE 2 HERE

Do those receiving less education have a poorer QoL than those with more education? Is any trend reflected in the available QoL dimensions?

Overall QoL was good with all domain means exceeded the scalar mid-point of 50. Social QoL was best and environmental QoL the poorest. Table 2 shows that all four QoL domains increased significantly, consistently and sequentially from no education up to secondary school education, where the trend levelled off. Those without education reported much poorer QoL than those who completed any educational level, including just primary school. Those who completed secondary education reported better QoL than those who only finished primary school. Only the environment domain fully confirmed the predicted positive trend across all four educational levels. In particular, those receiving tertiary education had better environmental QoL than those with secondary education. Increased QoL in the psychological, physical, and social domains was confirmed only for the three lowest educational levels.

Unpacking the domain trends, a facet analysis was conducted (see Table 3). QoL tended to increase across educational levels on all 25 facets, including general QoL and health ($p<.001$). Most differences between pairs of successive educational levels were significant up to the completion of secondary school. However, the pattern was more varied between secondary and tertiary levels with only five facets differentiating between groups: positive feelings, dependence on medication and treatment, physical environment, financial resources, and opportunities to acquire new information and skills. These results provided only limited support for the view that tertiary education confers widespread benefits to QoL over secondary education.

INSERT TABLE 3 HERE

The poorest QoL was reported by those without education where QoL was poor on nine dimensions of the profile. Unacceptable areas of QoL were lack of positive feelings, inadequate financial resources, little information and skills, few opportunities for recreation and leisure, and weak spiritual, religious and personal beliefs. Uneducated participants also reported that their QoL was barely acceptable in terms of their ability to think, perceived physical safety and security and energy levels. The quality of sex-life and working capacity varied least in relation to a respondent's educational level, remaining relatively stable. Those receiving primary and secondary education had similar self-esteem, negative feelings, personal relationships, home environment, physical environment, and perceived access to health and social care indicating that secondary education has little impact on these aspects of QoL.

Is the relationship between educational level and QoL influenced by a country's level of development?

Table 2 confirmed as expected, that QoL was good in highly developed countries and better than less developed countries where it was acceptable to fairly good. Developing countries reported poorer QoL than developed countries in the psychological (QoL; $F=64.5$; $p<.001$), physical ($F=14.0$; $p<.001$), and environment QoL ($F=119.5$; $p<.001$) domains. However social relationships were equally good ($F=1.96$; $p<.162$) irrespective of development level.

A significant interaction indicated that the HDI bands showed positive but different QoL trends across educational levels. High band countries largely replicated the overall pattern of the total sample showing no differences between secondary and tertiary education in physical ($p=.19$), psychological ($p=.98$), and social ($p=.99$) domains, but confirming a difference in the environment domain ($p<.001$). Uneducated people from high band countries

reported that their QoL was barely acceptable and much poorer in this band than the other three education groups. It was unusual, as their QoL was poorer than the equivalent uneducated group in the medium band countries with physical health worst. Also within the high band, those receiving secondary education largely reported the best QoL, particularly physical.

Medium band countries showed a positive QoL trend across educational levels that was different from high band countries and usually lower. Even after tertiary education, people from developing countries had poorer QoL than those who received only primary education in developed countries, indicting the extent of inequalities. Developing countries showed a significant, sequential and more linear increase in QoL between primary, secondary and tertiary educational levels on every domain, and greater variation within domains. However in the medium band, no difference was found between the QoL of uneducated and primary educated respondents in the physical ($p=.13$), social ($p=.07$) and environmental domains of QoL ($p=.22$). Only psychological QoL differentiated between the two lowest education levels. Mental health was therefore the only QoL dimension to fully confirm predictions in the medium band. Although cross-sectional, the data provides insights into how QoL in different educational systems might change during economic development.

Do gender, age and health status affect the relationship between QoL, educational level and development?

Covariates of age-band, gender and health status were included in the analysis (Table 2) to examine their impact on the relationship between educational level, QoL and development. The multivariate test shows that they all had a overall impact. While significant differences remained between the QoL of groups after adjustments were made for age and health status, this did not occur for gender, showing that the groups were similar. Health status had the strongest effect. Inspection of means showed that a cohort effect partly explained the age result, as a majority of the uneducated subgroup (59%) exceeded 50 years. As universal primary education is established when countries develop and is an index of it, this cohort effect was expected.

Is the association between education and QoL influenced by culture?

It was possible to examine the influence of culture in view of the diverse locations of the 14 collaborating centres. MANCOVA was used to test the relation between QoL and educational level in centres, adjusting for age and gender. Incomplete health status data for some centres prevented its inclusion in centre comparisons. As expected, a significant overall difference in QoL was found between centres and a significant interaction between QoL, educational level and centre was also confirmed (Table 4). When culture

(centres) was added into this analysis, the variance explained increased, indicating the importance of culture to this effect.

INSERT TABLE 4 HERE

It was also relevant to find out how far individual cultures would demonstrate the predicted relationship between QoL and educational level so the analysis was carried out on centre data. Nine out of 14 centres supported the predicted result through a significant interaction between education and QoL, adjusted for gender and age (Table 4); six strongly. Significant positive results were found for all medium band centres, and three high HDI countries. Negative trends in Argentina showed that highly educated reported the worst QoL. A fuller explanation lies beyond economic development, in unmeasured variables.

Discussion

The present study confirmed that QoL was indeed better for those who received more education (e.g. Regidor et al, 1999). However, the use of a state of the art multilingual generic profile of 25 ‘universal’ dimensions provided further complex insights into the relationship between life qualities, educational level, culture, and development. While all four QoL domains showed a positive trend across educational levels, significance testing showed that psychological, physical, and social QoL increased only between the first three levels, not beyond secondary school. Only environmental QoL confirmed expected significant increases at each of the four educational stages.

When the detail was scrutinised, just six facets of QoL differentiated between those who completed higher and secondary education. Most importantly, it was found that those with most education did have the best general QoL and overall health. Tertiary education therefore adds something extra to the ‘good life’ over secondary education. However, increases to QoL that appear to accrue from tertiary education amount to only one quarter of the possible subjective QoL dimensions. In particular, more highly educated respondents reported more positive feelings of happiness and contentment, and less dependence on medication and treatment. These health inequalities have implications for future policy on the provision of mental health care services (Patel, 2001). Most highly educated respondents also reported more positive perceptions of environmental QoL, in terms of their financial resources, physical environment e.g. pollution, and access to information and skills. However it is plausible that by adulthood these views could have changed as a result of the superior earning power attained by graduates (Purcell, Elias, et al, 2005) which secures a better environment to live in, and in turn could enhance QoL further. In contrast, those with least education reported not only the

poorest overall QoL and health, but saw financial resources to be poorer than any other QoL facet. This finding underscores feelings of deprivation in this educationally disadvantaged group, as respondents are asked whether they had enough money to meet their needs. Unsatisfactory QoL may serve to undermine mental and physical health in uneducated people.

Unusual among many other health-related QoL assessments, the WHOQOL-BREF includes an environmental domain on subjective evaluations of material resources and conditions. As a result, this international outcome measure complements 'objective' indicators of material conditions typically gathered by economists. The literature reveals that assessments of environmental QoL have developed quite separately from health-related QoL, and these two research traditions have rarely 'talked' to each other (Skevington, 2009). This seems short-sighted, in view of the utility of environmental information to improvements in public mental and physical health.

When economic development was addressed, those living in highly developed countries reported better psychological, physical and environmental QoL than less developed countries. Furthermore, QoL for those in highly developed countries echoed a very similar pattern to overall trends found across educational levels for the total sample. However, social QoL was equally good, irrespective of development band. Social QoL was the best domain in the developing world, reflecting its particular value to people living in poorer economic circumstances (Biswas-Diener & Diener, 2001). Our international results serve to strengthen the argument that social QoL is relatively good cross-culturally and potentially globally, being relatively untouched by the economy. Social relations seem to buffer the QoL of poorer people against the impact of scarce material resources, especially for those with least education.

A different and distinctive pattern was reported by less developed countries where QoL was better on all four domains for those who received tertiary education compared with secondary school. This demonstrates the added value that higher education later provides to adults living in developing countries. Furthermore, for least educated groups, results for medium band countries were also different to high, as there were no differences between uneducated and primary school groups in terms of physical, social and environmental QoL. Although all trends were positive, psychological QoL was the only domain that increased at all four stages of education for those living in the developing world. Our international data showed that more stages of education are closely associated with better mental health. Psychological QoL therefore may act as an indicator that within the profile uniquely

distinguishes the QoL of people in developing and developed countries via its association with education; these domain scores were found to be sensitive to the impact of educational level. New research could investigate its role as an indicator in relation to global indices of psychiatric morbidity. Through this cross-cultural investigation, it is possible to see how a full education has positive mental health implications for developing communities, and could serve to promote the adequate provision of mental health services and access to them. Universal education therefore has an essential role to play in improving mental health among the educationally disadvantaged. Looking at the facet detail on mood within the psychological domain, positive feelings increased across educational level and negative feelings tended to diminish, particularly after primary education. This suggests that secondary education may consolidate good adult mental health in less developed countries.

However the results did not show that QoL related to negative feelings was unacceptable among the least educated subgroup, even though depression is known to be common (e.g. Galea, Ahern, Nandi et al, 2007). Instead, we found poor levels of positive feelings, reflecting deficits in happiness and contentment and these are directly linked to depression (e.g. Skevington & Wright, 2001). The results indicate how mood states during adulthood are closely linked to educational level attained in childhood.

The impact on adult QoL of a lack of education in childhood is further underscored by results from an increasingly rare minority of uneducated people living in highly developed nations. For this subgroup, QoL was as poor as it was for uneducated people in developing countries; furthermore, their social QoL was even poorer than for the comparable group in the developing world. Living in a developed country that prizes education and takes it for granted appears to have an additional disenchanting effect on the social QoL of those who are uneducated, and the results point to stigma in cultures where education is a right, and an accepted norm.

The difference between development bands at the two lowest educational levels may relate to the pragmatics of delivering primary education in the developing world. While national statistics from some developing countries indicate internationally acceptable rates of primary school education, the reality is that children may only attend for a half day or on certain weekdays, or when the family can pay. Also 20% of those at secondary school age are still enrolled in primary school (UN, 2007). Through diluting the educational experience in developing countries, primary schooling may not be making a significant impact on QoL. Financial aid to provide universal education up to the end of primary school has been called for (WHO, 1998; UN, 2007; DFID,

2001) and empirical data from the present study supports this global initiative on which better mental health may be built.

The QoL of women and men is affected differently by the educational level received and a disproportionate number of girls do not receive education (UN, 2007). Without equal educational opportunities, women's QoL seems destined to be poorer. Culture played an important but variable role in the way that QoL relates to educational level, which is in part, attributable to different educational systems. However, we found considerable similarity in the way that QoL related to educational level in different cultures, as the majority of individual centres confirmed the overall findings.

The findings tentatively suggest that as development progresses, the QoL gap closes between those in secondary and higher education, and opens between uneducated and primary educated people. New investigations of rapidly growing economies e.g. India & China, should examine whether the current findings can be replicated during change. In addition, it is unclear whether the levelling off of QoL after secondary level is due to a 'ceiling' in highly developed countries, or whether tertiary education can only enhance a few specific aspects of QoL.

A cross-sectional design limits conclusions about processes that would be more confidently answered by longitudinal data. Inclusion of more low HDI countries would have improved comparisons. Centres in South-East Asia and Africa would have broadened the cultural range. Despite quotas, centres did not collect identical age, health status and educational profiles. Access to disadvantaged groups is problematic for many inequality studies (Gwatkin, 2001).

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Table 1: Descriptive statistics for centres ranked by the Human Development Index (HDI) (1999)

Centre	Total	HDI	Men	Women	Age^	0	1	2	3
High HDI									
Australia	38	0.936	12	26	41.2	0	8	9	21
USA	159	0.934	47	112	43.9	0	2	38	119
Netherlands	41	0.931	27	14	41.8	2	2	17	20
Norway*	1036	0.931	426	604	52.2	13	222	463	338
Japan	50	0.928	25	25	46.2	0	0	27	23
UK	27	0.923	14	13	36.6	0	2	10	15
Germany*	2388	0.921	1073	1309	48.0	0	1135	1050	203
Italy*	378	0.909	192	185	47.7	2	160	139	77
Spain*	646	0.908	318	321	41.5	34	241	268	103
Israel*	446	0.893	174	272	31.7	1	22	157	266
Greece	48	0.881	29	19	39.1	0	5	24	19
Argentina*	106	0.842	27	79	47.7	0	42	38	26
Hungary*	469	0.829	250	211	46.8	6	152	202	109
Croatia*	406	0.803	260	146	39.5	3	33	269	101
Medium HDI									
Russia	296	0.775	145	151	44.9	2	7	104	183
Malaysia*	316	0.774	157	159	44.2	27	89	172	28
Romania	50	0.772	34	16	39.9	0	0	36	14
Bulgaria*	192	0.772	95	97	41.2	9	111	63	9
Brazil*	306	0.750	147	159	43.1	102	74	93	37
Turkey	48	0.735	29	19	40.6	3	5	17	23
China	50	0.718	27	23	36.4	0	2	26	22
India: Delhi*	1438	0.571	755	660	42.2	295	205	465	473
India: Madras*	420	0.571	205	215	61.4	227	143	45	5
Low HDI									
Nigeria*	50	0.455	27	23	37.4	5	4	11	30

Note: *Sites included in Centre analysis; ^ Age range 12-97 years

Educational stage completed: 0=No Primary, 1=Primary, 2=Secondary, 3=Tertiary

Table 2: MANCOVA of quality of life, educational level and Human Development Index (HDI) band with repeated QoL domains and covariates of age, gender and health status (estimated marginal means (& SDs) presented)

High HDI	N	Physical	Psychological	Social	Environment
0. No Primary	50	49.6 (20.8)	52.6 (21.6)	53.1 (24.1)	51.6 (19.7)
1. Primary	1767	64.2 (20.9)	65.7 (17.9)	65.1 (20.3)	64.0 (16.3)
2. Secondary	2156	70.0 (19.8)	68.1 (17.8)	68.3 (20.4)	65.4 (16.1)
3. Tertiary	854	65.3 (19.6)	66.6 (17.3)	67.4 (19.9)	66.4 (16.6)
Total High	4827	66.4 (20.4)	66.8 (17.9)	66.8 (20.3)	64.9 (16.4)
Medium HDI					
0. No Primary	397	55.1 (16.6)	55.6 (16.9)	59.7 (20.6)	51.3 (17.8)
1. Primary	495	56.3 (17.1)	57.4 (17.0)	61.4 (19.4)	52.0 (15.9)
2. Secondary	754	60.7 (16.9)	60.8 (16.2)	63.1 (20.4)	56.3 (15.7)
3. Tertiary	642	66.5 (15.3)	62.9 (15.8)	66.9 (17.7)	58.8 (15.4)
Total Medium	2288	60.4 (17.0)	59.7 (16.6)	63.2 (19.6)	55.2 (16.3)
Multivariate test (Pillais trace)	F	p	Partial eta sq		
QoL (domains)	27.89	.0001	.012		
QoL x Gender	25.03	.0001	.010		
QoL x Age	194.71	.0001	.076		
QoL x Health status	341.96	.0001	.126		
QoL x Education	3.26	.0001	.001		
QoL x HDI	20.71	.0001	.009		
QoL x HDI x Ed.	2.42	.01	.001		
Between subjects	Mean	df	F	p	eta sq
	sq				
Gender	1685.1	1	2.05	.152	.0001
Age	20608.9	1	25.11	.0001	.004
Health status	442411.6	1	539.06	.0001	.071
Education	28347.7	3	34.54	.0001	.014
HDI	66583.7	1	81.13	.0001	.011
Educ. x HDI	5288.9	3	6.44	.0001	.003
Error	820.7	7104			

Table 3: Analyses of variance of quality of life facets (WHOQOL-BREF) and educational level (df = 3, 9365)

Educational level /Facets	0. Unfinished primary	1. Primary school	2. Secondary school	3. Further/ Higher	F	p
D1 Physical						
Pain & discomfort	3.24 (1.1)	3.65 (1.2)	3.79 (1.2)*	3.86 (1.2)	58.40	<.001
Dependence on Treatment/Medic'n	3.10 (1.1)	3.46 (1.3)	3.63 (1.3)	3.82 (1.2)	69.83	<.001
Energy & fatigue	2.98 (0.9)	3.26 (1.0)	3.62 (1.0)*	3.66 (1.0)	97.79	<.001
Sleep & rest	3.13 (1.1)	3.43 (1.1)	3.61 (1.1)*	3.64 (1.1)	53.29	<.001
Mobility	3.07 (1.0)	3.61 (1.1)	3.92 (1.0)*	3.92 (1.0)	166.83	<.001
Activity: daily life	3.25 (1.0)	3.51 (1.0)	3.68 (1.0)*	3.67 (1.0)	48.04	<.001
Working capacity	3.20 (1.0)~	3.33 (1.1)	3.59 (1.1)*	3.63 (1.0)	61.51	<.001
D2 Psychological						
Positive feelings	2.72 (1.1)	3.30 (1.0)	3.43 (1.0)	3.56 (1.0)	132.59	<.001
Spirituality	2.87 (1.1)	3.55 (1.0)	3.67 (1.1)*	3.74 (1.0)	142.79	<.001
Cognitions	2.95 (0.9)	3.44 (0.9)	3.59 (0.9)*	3.63 (0.9)	121.77	<.001
Body image	3.31 (1.0)	3.71 (1.0)	3.82 (1.0)*	3.81 (1.0)	59.56	<.001
Self-esteem	3.37 (1.0)	3.56 (1.0)#	3.63 (1.0)*	3.61 (0.9)	15.93	<.001
Negative feelings	3.21 (1.2)	3.63 (1.1)#	3.61 (1.0)*	3.56 (0.9)	33.15	<.001
D3 Social						
Personal Relat'ns	3.40 (1.0)	3.75 (1.0)#	3.80 (1.0)*	3.81 (0.9)	37.19	<.001
Sex-life	3.23 (1.0)~	3.26 (1.1)	3.43 (1.2)*	3.43 (1.1)	15.91	<.001
Social support	3.32 (1.0)	3.63 (1.0)	3.72 (1.0)*	3.79 (0.9)	48.72	<.001
D4 Environment						
Physical safety	2.97 (1.0)	3.38 (1.0)	3.54 (1.0)*	3.60 (0.9)	9.41	<.001
Physical Envir't	3.08 (0.9)	3.39 (1.0)#	3.45 (1.0)	3.55 (1.0)	47.12	<.001
Financial resources	2.57 (1.0)	3.07 (1.1)	3.19 (1.1)	3.41 (1.1)	120.26	<.001
Information & skills	2.76 (1.0)	3.48 (1.1)	3.64 (1.1)	3.74 (0.9)	20.41	<.001
Recreation/leisure	2.76 (1.9)	3.11 (1.9)	3.26 (1.1)*	3.25 (1.1)	44.82	<.001
Home environment	3.43 (1.0)	3.81 (1.0)#	3.81 (1.0)*	3.85 (1.0)	34.59	<.001
Health & social care	3.48 (1.0)	3.70 (0.9)#	3.69 (1.0)*	3.72 (1.0)	12.46	<.001
Transport	3.27 (1.0)	3.57 (1.0)	3.71 (1.1)*	3.71 (1.1)	43.98	<.001

Post-hoc comparisons NOT significant (p<.001) between educational level:

0 vs 1 = ~ ; 1 vs 2 = #; 2 vs 3 = *

Table 4: MANCOVA (repeated measures) for each centre of the relationship between educational level and quality of life with adjustments for age and gender.

Centre	Domain	P	0	1	2	3	Education x QoL		
							F	p	% eta
Norway	Physical	.0001***	38.5	50.7	53.9	54.9	4.77	.0001***	1.4
High HDI	Psychol.	.004**	56.8	63.4	64.8	66.8			
	Social	.036	55.7	65.1	67.6	68.4			
	Envir'nt	.0001***	50.9	63.9	69.7	73.4			
Germany	Physical	.001***		73.8	74.9	69.9	4.16	.0001***	0.5
High HDI	Psychol.	.064		71.4	73.1	71.5			
	Social	.095		69.8	71.5	72.1			
	Envir'nt	.049		68.9	70.4	70.6			
Italy	Physical	.0001***	52.6	62.0	71.1	69.3	2.90	.002**	2.3
High HDI	Psychol.	.726	57.6	66.9	67.6	65.6			
	Social	.869	63.3	64.9	63.8	65.9			
	Envir'nt	.095	48.7	56.4	60.8	58.8			
Spain	Physical	.0001***	56.4	56.1	62.1	69.6	1.00	.434	0.6
High HDI	Psychol.	.0001***	49.2	53.8	60.4	65.2			
	Social	.001***	49.1	52.0	58.2	62.9			
	Envir'nt	.0001***	49.9	51.7	56.4	65.1			
Israel	Physical	.0001***		57.9	73.7	73.7	1.19	.310	1.1
High HDI	Psychol.	.01**		61.1	69.7	70.3			
	Social	.148		64.0	72.6	71.8			
	Envir'nt	.0001***		52.2	65.6	65.9			
Argentina	Physical	.021		41.6	37.3	31.7	3.34	.004**	9.1
High HDI	Psychol.	.001***		42.7	32.6	26.7			
	Social	.004**		50.9	40.6	32.7			
	Envir'nt	.70		44.7	44.3	41.7			
Hungary	Physical	.0001***	54.6	53.7	62.5	68.5	2.20	.021*	1.7
High HDI	Psychol.	.003**	56.1	54.7	58.7	62.9			
	Social	.191	67.3	57.6	60.4	62.8			
	Envir'nt	.001**	61.6	55.1	60.9	62.5			
Croatia	Physical	.0001***	52.2	54.4	57.8	66.8	1.27	.252	0.9
High HDI	Psychol.	.003**	60.9	62.2	62.4	69.4			
	Social	.366	68.8	68.9	66.4	70.2			
	Envir'nt	.0001***	56.7	53.7	55.5	64.3			
Malaysia	Physical	.001***	50.8	49.3	58.7	63.3	2.65	.005**	2.5
Medium HDI	Psychol.	.025	61.0	63.2	67.4	66.8			
	Social	.057	62.2	65.6	69.1	69.1			

	Envir'nt	.0001***	55.3	57.4	64.2	67.7			
Bulgaria	Physical	.072	60.5	58.3	66.7	61.5	2.08	.032*	3.3
Medium HDI	Psychol.	.468	50.5	55.9	58.2	48.8			
	Social	.312	55.6	56.5	62.7	53.4			
	Envir'nt	.053	57.4	49.1	51.9	37.4			
Brazil	Physical	.001***	57.1	59.4	63.0	72.3	3.24	.001***	3.2
Medium HDI	Psychol.	.450	64.4	67.5	67.6	68.6			
	Social	.361	68.1	70.7	73.6	69.5			
	Envir'nt	.001***	55.8	55.4	63.4	63.7			
India: Delhi	Physical	.0001***	55.4	56.6	60.3	66.9	2.38	.01**	0.5
Medium HDI	Psychol.	.0001***	52.4	51.7	58.8	64.7			
	Social	.0001***	53.5	53.9	62.1	68.2			
	Envir'nt	.0001***	49.2	49.5	57.5	62.8			
India: Madras	Physical	.168	52.6	53.9	57.9	53.6	1.94	.043*	1.4
Medium HDI	Psychol.	.038	45.3	49.9	51.3	48.9			
	Social	.088	59.6	63.6	63.2	68.2			
	Envir'nt	.032	50.2	54.2	53.7	45.9			
Nigeria	Physical	.01**	36.4	77.6	64.1	68.3	1.69	.098	10.8
Low HDI	Psychol.	.002**	35.7	62.1	53.0	70.7			
	Social	.117	38.5	67.9	58.7	64.0			
	Envir'nt	.096	34.1	63.7	53.8	56.3			

Notes: Educational level: 0 = No Primary, 1 = Primary, 2 = Secondary, 3 = Tertiary .

Sig. * $p < .05$, ** $p < .01$, *** $p < .001$

MANCOVA of all centres across education level with repeated measures of quality of life domains and co-variates of age and gender.

Multivariate tests

Effect	F	df	Sig.	Partial Eta Squared
QoL	93.309	8125	.0001	.033
QoL x Age	170.467	8125	.0001	.059
QoLx Gender	29.502	8125	.0001	.011
QoL x Education	2.559	24381	.006	.001
QoL x Centre	16.779	24381	.0001	.026
QoL x Education x Centre	2.773	24381	.0001	.012

Between-Subjects Effects

	Type III Sum	df	Mean Square	F	Sig.	Partial Eta
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Source	of Squares					Squared
Age	47723.360	1	47723.360	64.751	.0001	.008
Gender	7795.716	1	7795.716	10.577	.001	.001
Education	25284.926	3	8428.309	11.436	.0001	.004
Centre	694636.437	13	53433.572	72.499	.0001	.104
Education x Centre	105480.554	36	2930.015	3.975	.0001	.017
Error	5989812.131	8127	737.026			